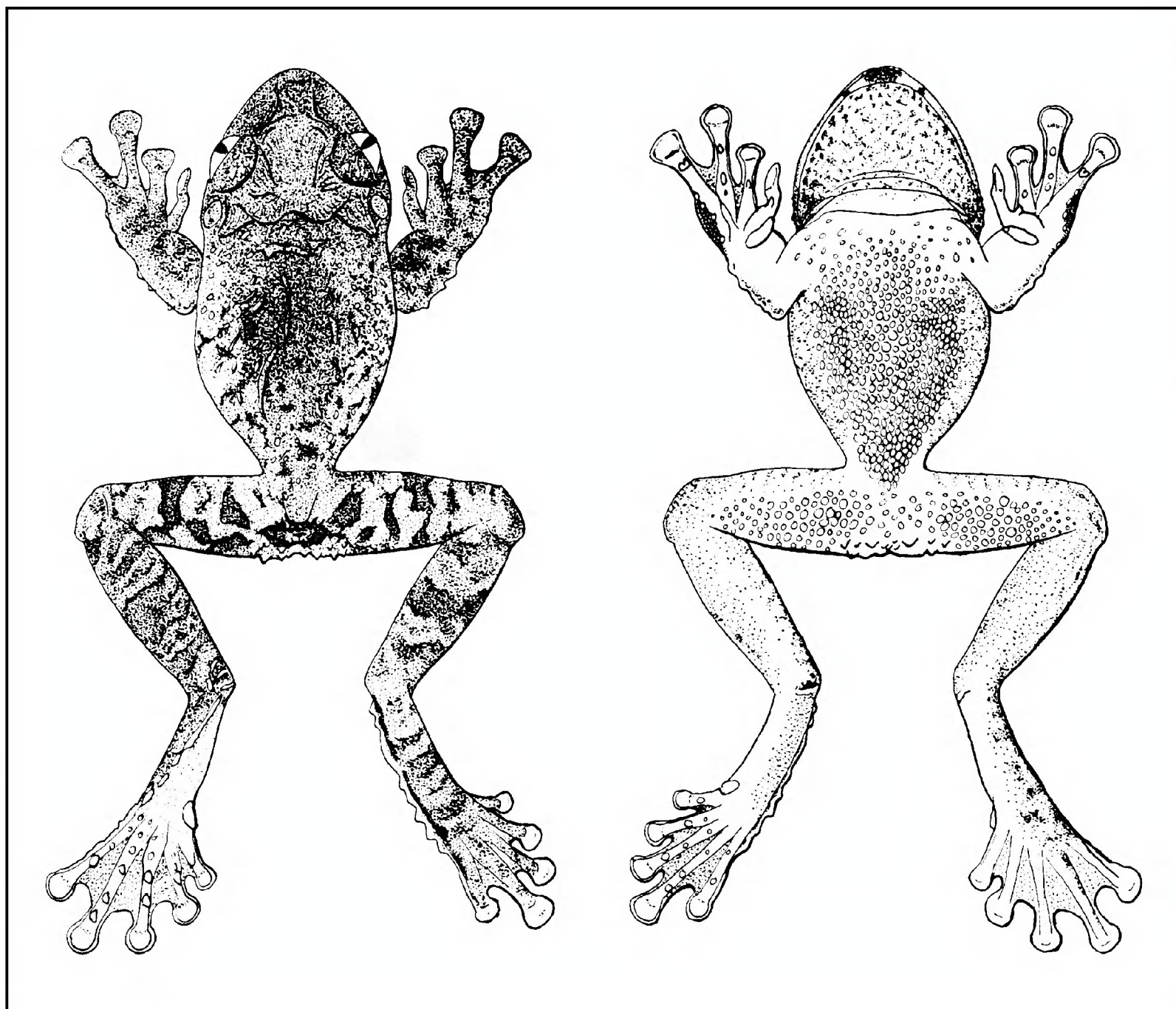

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BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

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Cover: Jamaican snoring frog, *Osteopilus crucialis*. Drawing (as *Hyla lichenata*) from *The Herpetology of Jamaica. I. Amphibians* by W. Gardner Lynn, Bulletin of the Institute of Jamaica Science Series, Number 1, 1940.

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Notes on the Herpetofauna of Western Mexico 2: Distribution Patterns of Reptiles in the Mexican State of Jalisco

Daniel Cruz-Sáenz¹, David Lazcano², Sergio Guerrero¹ and Jorge Téllez-López³

Abstract

Geographic Information Systems technology was used to analyze the distribution and species richness of the reptiles of the state of Jalisco, and its association with vegetation types, physiographic provinces, altitude, climate and herpetological provinces. Data were obtained from voucher specimens deposited in 10 national and international zoological collections, comprising 2552 catalogued specimens. We found that there are 151 species of reptiles for the state of Jalisco. The analysis demonstrated a need for stronger efforts in sampling the eastern and northern regions of the state.

Resumen

Utilizando los sistemas de información geográfica como herramienta se realizó el análisis de la distribución y la riqueza de las especies de reptiles para el estado de Jalisco, con relación a tipos de vegetación, provincias fisiográficas, altitud, clima y provincias herpetológicas. Este se efectuó a partir de registros obtenidos de colecciones zoológicas que tuvieran ejemplares colectados en el estado. Se obtuvo un total de 2552 registros de 10 colecciones nacionales y extranjeras. Encontramos que en Jalisco se presentan 151 especies de reptiles. El análisis dejó ver que hace falta realizar un esfuerzo importante en muestrear la región Este y Norte del estado.

Introduction

The distribution of living organisms have been studied for some years using the Geographic Information Systems (GIS) tool and in particular some GAP (Geographic Approach to Protection of Biological Diversity) models. These provide a fast glance at the distribution and conservation status of various components or indicators of biodiversity. This analysis organizes the existing information to identify or detect areas of high biodiversity that need to be put aside before they are degraded (Scott et al., 1993). The GAP analysis helps identify differences between information systems or applications. This tool provides the fundamental information necessary to pinpoint natural protected areas based on the distribution of registered reports through provinces and municipalities.

Natural history collections in museums contain critical data that can be used for making important decisions about conservation of biodiversity. Collectively these specimen data bases describe the distribution of a known taxon through a time and spatial span (Ponder et al., 2001).

Flores-Villela (1993b), placed the Mexican herpetofauna in 10 natural regions defined by climate and vegetation type. Flores-Villela (1993a) described the distribution patterns of Mexico's reptiles and amphibians, including areas of endemism and factors that generate this distribution. Flores-Villela and Gerez (1994) looked at the distribution of Mexican vertebrates, including reptiles, and reported 92 species of reptiles for the state of Jalisco.

This article provides information on the patterns of distribu-

tion and species richness for the state of Jalisco and the associated vegetation types, physiographic provinces, altitudes, climates and herpetological provinces. This analysis provides information as to the effect these factors have on the distribution of reptiles in the state. Furthermore, this analysis allows the identification of areas that are missing information and could be considered a priority for conservation.

Study Site

The state of Jalisco has a surface area of 78,890 km²; it is



Figure 1. Map of the state of Jalisco and neighboring states.

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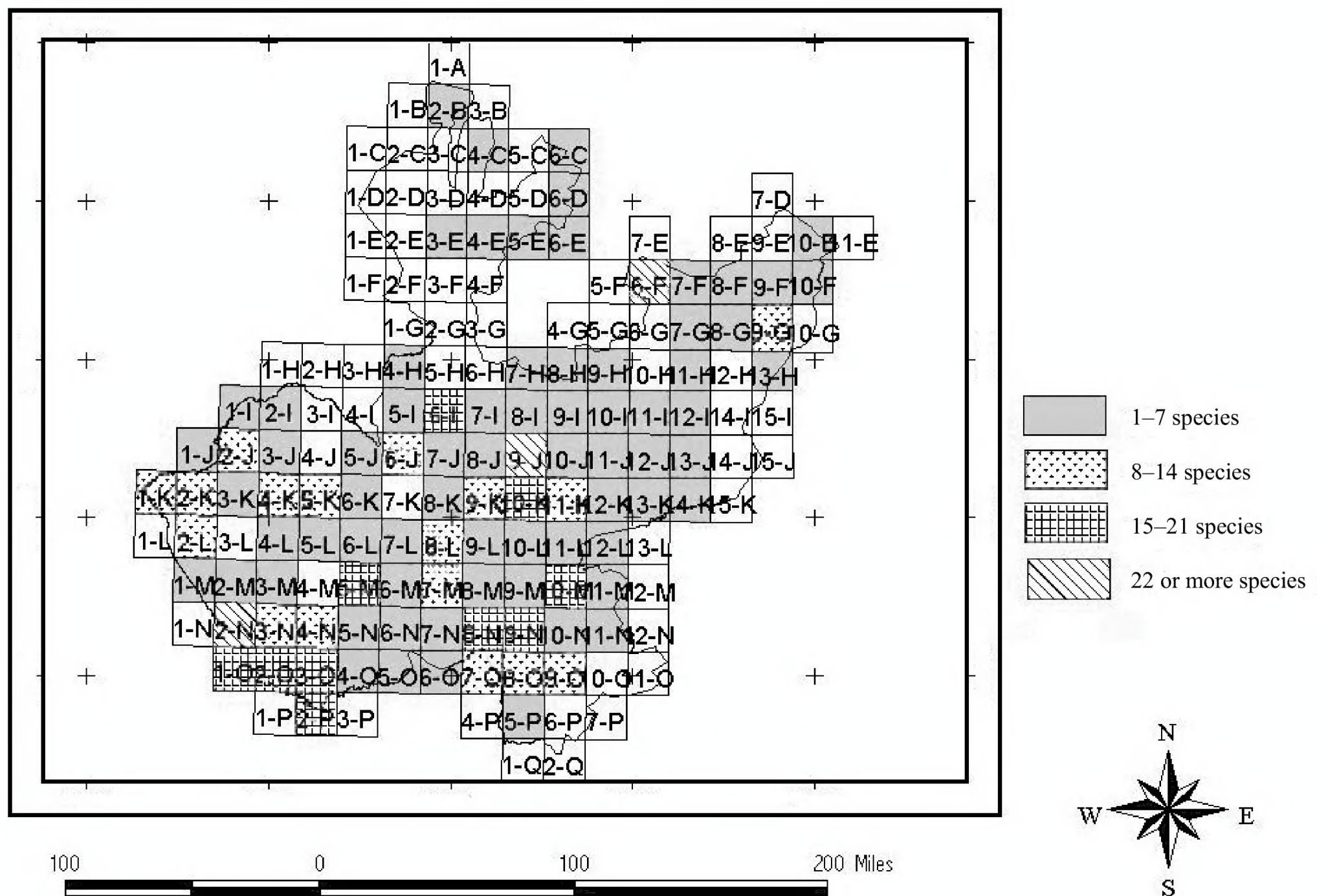


Figure 2. Distribution of reptile species richness in the state of Jalisco using Geographic Units of Classification (UCGs).

located in western Mexico, between $18^{\circ}15'05''$ and $22^{\circ}51'49''$ north latitude and $101^{\circ}28'15''$ and $105^{\circ}43'18''$ west longitude. Jalisco is bordered to the north by the states of Zacatecas, Aguascalientes, Durango and Nayarit; to the east by the states of San Luis Potosí, Guanajuato and Michoacán; to the south by the states of Colima and Michoacán and to the west by the Pacific Ocean (INEGI, 1981). Its geographic position straddles two biogeographic regions: Nearctic and Neotropical. Within the state there are four physiographic provinces: *Sierra Madre Occidental*, *Eje Neovolcánico* [Neovolcanic Belt], *Altiplano Mexicano* [Mexican Plateau] and *Sierra Madre del Sur* (INEGI, 1981; Morrone, 2005). The conjunction of these provinces and the very irregular orography allows a wide variety of climates, vegetation types and biological diversity to emerge.

Due to the diverse environmental conditions and habitats, Jalisco harbors 13 different vegetation types according to Rzedowski and McVaugh (1966): *palmar* (palm trees); *bosque tropical subcaducifolio y caducifolio* (tropical subdeciduous and deciduous forest); *bosque espinoso* (thorn scrub forest); *matorral subtropical* (subtropical matorral); *vegetación sabanoide* (coastal grasslands); *zacatal* (pasture); *matorral rosetófilo crasicaule* (succulent rosette scrub); *bosque de pino-encino* (pine-oak forest); *mesófilo de montaña* (montane mesophylllic forest); *bosque de oyamel* (oyamel fir forest); *vegetación semiacuática y acuática* (aquatic and subaquatic vegetation);

and *manglar* (mangrove forest).

Materials and Methods

Data for this study came from national and international zoological collections, from which we solicited their registered reports for reptile specimens from Jalisco. The collections from which information was obtained follow:

National: Colección de Vertebrados del Centro de Estudios en Zoología de la Universidad de Guadalajara; Colección Nacional de Anfibios y Reptiles del Instituto de Biología de la UNAM; Colección de Anfibios y Reptiles de la Facultad de Ciencias Biológicas de la UNAM; Colección Zoológica de la Universidad Autónoma de Guadalajara. **International:** Natural History Museum, University of Kansas; California Academy of Sciences, San Francisco, California; University of California at Berkeley; Field Museum of Natural History, Chicago, Illinois; National Museum of Natural History, Smithsonian Institution; and Natural History Museum, Louisiana State University.

To determine the herpetological species richness patterns for reptiles of the state of Jalisco, we followed the methods of Matson (1982) and Sánchez (1993). The state was divided into 162 Geographic Units of Classification (UCGs), each covering 15 minutes of latitude by 15 minutes of longitude, with an approximate surface area of 735 km². Each UCG was assigned a number and letter, with numbers running from east to west and

letters from north to south. Each registered report from the consulted collections was assigned to a corresponding UCG, based on the collecting data.

To relate the herpetological species richness patterns for the state of Jalisco to vegetation types, physiographic provinces, altitude, climate and herpetological provinces we used ARC-VIEW (ESRI 1997).

The latitude–longitude coordinates were converted to the decimal system; the geographic projection was changed to Lambert which is a cartographic conic projection used in aerodynamic navigation. With these new values a new data base was created, with an entry for each registered specimen and its spatial data. This served to relate the spatial data to the thematic descriptions (these were layers that already exist in the ARC-VIEW program for the state of Jalisco). Then the entries for the registered reports were superposed on the digital maps of vegetation types, physiographic provinces, altitude, climate and herpetological provinces. From the resulting data a similarity analysis was done.

We used the following maps: soil use, vegetation, physiographic provinces, altitude, climate herpetological provinces and municipality. These maps were from CONABIO, with a scale of 1: 4,000,000.

Results

In this analysis we had 101 of the 124 municipalities represented with at least one registered specimen. The registered specimens were categorized in 23 families, 73 genera and 151 species. The most heavily represented families were Phrynosomatidae with 741 specimens (29.0% of the total registered specimens) and Polychrotidae with 487 specimens (19.1%). Families that were poorly represented included Dermochelyidae (1 specimen) and Corytophanidae, Typhlopidae and Helodermatidae with 2 specimens each.

Species with the highest numbers of registered specimens were: *Anolis nebulosus* (483 specimens, 18.9% of the total); *Urosaurus bicarinatus* (187 specimens, 7.3%); *Sceloporus horridus* (107 specimens, 4.1%); and *Kinosternon integrum* (87 specimens, 3.4%).

Of the 162 UCGs that cover the state of Jalisco 99 (61%) had at least one registered specimen, and 63 UCGs (39%) had no information. The UCGs with the greatest species richness were 2-N with 55 species and 9-J with 40 species. These UCGs concentrate 38.4% of the registered specimens. Three UCGs were represented by at least 22 species; 17 UCGs were represented by a single registered species.

Superposition of vegetation type layers and the coordinates of the registered specimens revealed that the specimens were distributed among eight vegetation types: *bosque de coníferas y encinos* (pine and oak forest); *bosque espinoso* (thorn scrub forest); *bosque mesófilo de montaña* (montane mesophyllic forest); *bosque tropical caducifolio and subcaducifolio* (tropical subdeciduous and deciduous forest); *bosque tropical perennifolio* (tropical evergreen forest), *pastizal* (grassland) and *vegetación acuática y subacuática* (aquatic and subaquatic vegetation).

The vegetation type that harbored the highest number of species was *bosque tropical caducifolio* (tropical subdeciduous forest) with 144 species, followed by *bosque de encinos y coníferas* (pine and oak forest) with 94 species. The vegetation types with the fewest species were *bosque espinoso* (thorn scrub forest) and *vegetación acuática y subacuática* (aquatic and subaquatic vegetation).

Five distinct physiographic provinces in the state contained registered specimens: Southern Mexican Plateau-Zacatecas (*Altiplano Sur Zacatecas*), Pacific Coast (*Costa del Pacífico*), Blasas Basin (*Depression del Balsas*), Neovolcanic Belt (*Eje Neovolcánico*) and Sierra Madre Occidental. The maximum concentrations of species per physiographic province were in the Neovolcanic Belt with 111 species and the Pacific Coast with 88 species. Those with the lowest number of species were the Blasas Basin with 2 species and Sierra Madre Occidental with 13 species.

Two distinct herpetological provinces are present in Jalisco: the Neovolcanic Belt and the Western Mexican province. The Neovolcanic Belt included 118 species and the Western Mexican province 85 species.

The state was categorized by 15 distinct climate types. The maximum concentration of species (67) corresponded to the *Awo* type, which is subhumid and warm, with rains in the summer. And the minimum concentration of species (1) was for the *Am(f)* type, corresponding to humid, warm and rains in the summer.

Ten distinct altitude gradients from 0 to 4000 m were looked at. The maximum reptile species richness was found between 1500 and 2000 m (85 species) and between 0 and 200 m (73 species). Lowest species richness occurred between 3500 and 4000 m (1 species, *Barisia imbricata*).

Conclusions

Only 61% of the UCGs had information. The maximum species richness was restricted to 3 of the 162 UCGs, which confirms the need for stronger efforts conducting inventories in the eastern and northern regions of the state. More attention should be focused where the maximum number of species occur, such as the Neovolcanic Belt, the tropical subdeciduous and deciduous forest, and the altitude gradient between 1500 and 2000 m. Lost habitat there would be a threat to biodiversity. Likewise, more attention should be paid to the areas that had poor representation, such as thorn scrub forest, aquatic and subaquatic vegetation, the Blasas Basin and the Sierra Madre Occidental.

The amount, quality and disposition of the registered specimens play an important role when analyzing and operating the data base. More specimens would greatly enhance the analysis. Nevertheless the state has a rich and diverse herpetofauna with approximately 200 species. There is a huge need to continue studying the herpetofauna as a whole and the biology of individual species, for many of which the information is even scarcer.

Acknowledgments

We wish to thank the collections that provided the data base information for this article.

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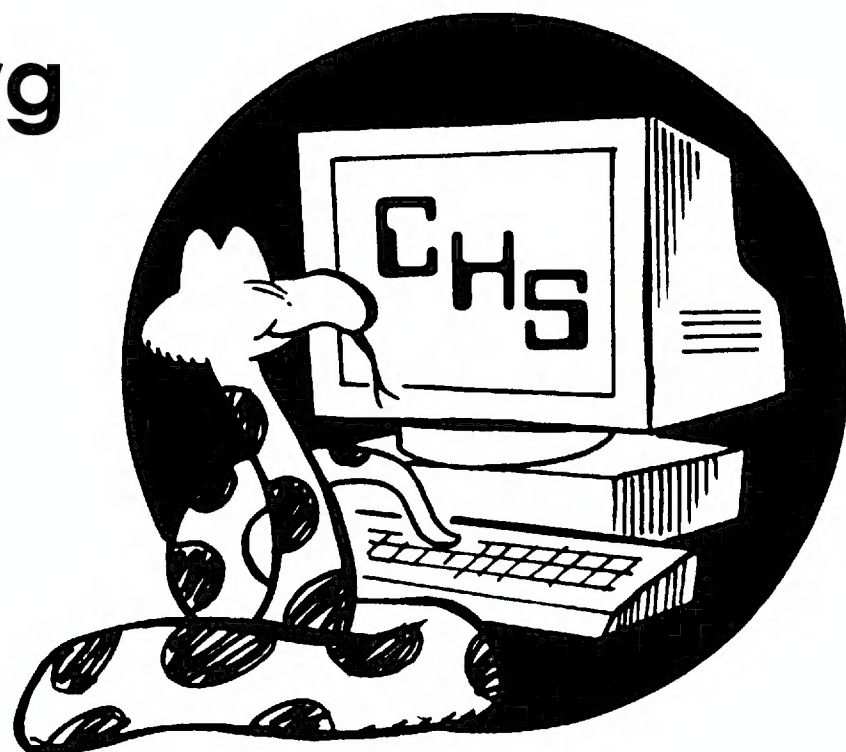
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Book Review: *Turtles of the United States and Canada* (Second edition) by Carl H. Ernst and Jeffrey E. Lovich. 2009. 827 pp. Johns Hopkins University Press, Baltimore. ISBN 13: 978-0-8018-9121-2. Hardcover \$95.00*

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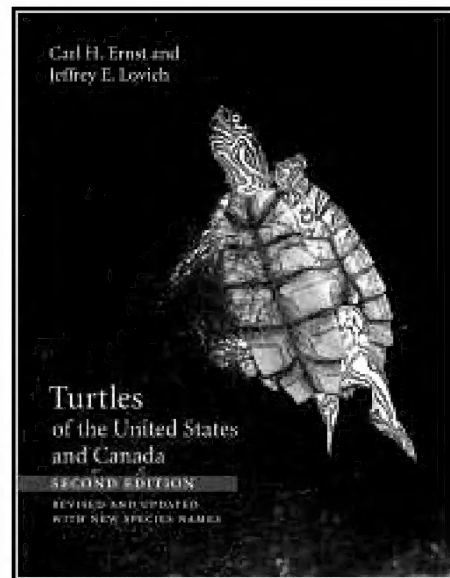
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My shelves sag under the weight of turtle books. Just the ones discussing North American turtles do justice to the term "volumes" when describing the amount of available literature one can accumulate. There are state and regional guides and others addressing single species, literary books, children's books, and ones on turtle conservation. And let's not forget all the journals, monographs and newsletters

of the various turtle and tortoise clubs and societies. But except for field guides, there have been surprisingly few attempts to provide accounts of all the turtles of North America. Pope's 1939 *Turtles of the United States and Canada*, Carr's classic 1952 *Handbook of Turtles*, Ernst and Barbour's 1972 *Turtles of the United States*, and Ernst, Lovich, and Barbour's (1994) earlier landmark edition of the title being reviewed, are all that come to mind. *Turtles of the World* (Bonin et al., 2006) also includes all of the North American species, but the coverage is not at all comprehensive and their accounts of many of our North American turtles are quite flawed and not referenced. I am certainly not about to dispose of my library because I now have the new edition of this book, though its size will require some rearranging of a few shelves, but if I did for some reason need to limit my turtle library to a single volume this book would be the one.

Both authors are widely recognized authorities and respected for their streams of contributions to our knowledge of turtles. The resulting book is not only comprehensive, but compiled by individuals with personal knowledge of many of the species they write about. Too many biological reference books are written by people with scientific backgrounds and good organizational skills, but only marginal familiarity with their chosen topic. This publication clearly benefits from both authors' first-hand experiences. Compared to the earlier edition the topics are covered in considerably more depth. There are additionally recognized species, and updated names of familiar ones. And not only is the page format larger, the second edition is about 250 pages longer. This is a testament to the tremendous increase in the interest and contributions of knowledge regarding our native turtles over the last several decades.

It is as complete and up-to-date as books can get. A few key facts that have only recently come to light, such as diamondback



terrapins being native to Bermuda, did not appear until after the book was about to go to press and are not included. The lengths of the various species accounts alone give a rather good understanding of both the depth of coverage and variation in the amount of study that has gone into a given species (for example: painted turtle account, 27 pages long; green turtle, 26 pages; wood turtle, 11 pages, Pascagoula map turtle, 4 pages).

The 58 species accounts are arranged alphabetically; first by family, then by genus and then species. Straightforward keys to genera and species are provided. Each species account is covered with subheadings addressing identification, genetics, fossil record, distribution, geographic variation, confusing species, habitat, behavior, reproduction, growth and longevity, diet and feeding behavior, populations and predators, and remarks. There are photos of various aspects of each turtle and distribution maps for all but the marine species. In fact there are more than two hundred color photographs, a number of which are from the late Roger Barbour's collection of excellent images that appeared in the 1994 version of this book.

While the bulk of the volume is devoted to individual species accounts other components of the book include a preface (mostly acknowledgments), a list of abbreviations, an introductory chapter, chapters on conservation and identification, a glossary of scientific names, an index to common and scientific names, and an expansive 169-page, 5,200+ citation, bibliography.

While this is clearly one of the best single-volume biological references produced to date, and is packed from cover to cover with pertinent information, I must admit I miss the style, personal insights, and the asides found in the published works of the previous generation. Archie Carr's *Handbook of Turtles* remains a classic. One annoying aspect of modern science is the increased use of abbreviations and acronyms in the text. These have worked their way into this volume en masse. While some such as ORV, GIS and USFWS are standard and probably understood by most, inclusion of IP (incubation period), CT (cloacal temperature, not just for turtles living in Connecticut), or IGF-I (insulinlike growth factor I) subtracts from readability and from helping the general public acquire an understanding of turtles and their conservation needs. On page 32 the authors state that one of the major purposes of their book is to make people more interested in the protection of turtles through awareness of the many fascinating aspects of turtle biology. We are already asking readers of our scientific output to deal with metric units, taxonomic keys, unexplained sex ratio notations (1.7-1.84), telegraphic statements, statistical proof that the big ones are significantly larger than the little ones, and sentences continu-

ally interrupted with scientific names and literature citations. Why the added burden of miscellaneous abbreviations (MA)? What's next, following the lead of the ornithological community in their renaming of birds with species codes?

The 52 species distribution maps are without doubt the most accurate and up-to-date assemblage published. That said, the base maps only show state borders, so they are not as detailed as they might be. For riverine species with restricted or disjunct distributions, such as map turtles and some of the cooters, it would have been informative to use base maps similar to the ones in ichthyological publications that also show major drainage basins. The map showing the distribution of the bog turtle is certainly the most accurate one to date in a book of this type but the scale of the map does not depict how limited the current range actually is. Along similar lines the distribution map for the diamondback terrapin illustrates the extent of the linear coastal distribution, but the scale of the map prevents depiction of what a narrow coastal zone the species occupies; in many areas it is less than a mile in width. Despite the extremely rich diversity of turtles in the southeastern United States and the interesting distributions of species complexes like map turtles, there is little discussion regarding the zoogeography of our turtles.

Similarly, even with all of our regional historic cultural ties to native turtles, most of which were at the expense of the turtles' populations, there is little coverage of this in this book. One page in the introduction briefly addresses this, but mainly deals with commercial exploitation. The turtle crawls at Key West, 4th of July box turtle races, gopher pulling, Suwannee chicken, Seminole Indian softshell turtle farms, and the rich cultural history of terrapin fisheries on the Chesapeake Bay, to name a few, when mentioned at all are only briefly alluded to. These past and current cultural uses bridge biological and human interest and help in understanding the many connections between people and turtles.

One chapter in the book is devoted to turtle conservation needs. Conservation is also addressed under "Populations:" where the authors outline various conservation issues regarding the individual species being discussed. Yet in the individual species write-ups the reader is often simply directed to a list of references regarding conservation. The conservation chapter itself summarizes general reasons for decline: habitat loss, introduced species, pollution, disease, unsustainable use and climate change. Other topics include status and determinants of endangerment, and what can be done to save our turtles. While I am pleased to see that the conservation concerns for various turtles are included, as readers, and concerned citizens, we are given little specific guidance as to what we can do. Yet considering that at least 63% of our turtles are in need of conservation, this aspect of the book seems somewhat superficial. Regulations alone do not necessarily save species. How can we empower an

army of volunteers and citizen scientists to help? Based on the inspirations of Archie Carr and his followers, the sea turtle folks are doing this on a number of important levels. Agencies need to recruit the public sector and encourage their involvement in meaningful conservation and management programs. This book could have been a pro-active source of ideas for agencies in need of building stronger conservation programs.

It would be impossible to have consistency in a book of this type; not only are the conflicting opinions of various researchers across time represented in the text, but the authors themselves are certainly entitled to their points of view. For example, it is interesting that the authors continue to use growth annuli in their discussions of age determination for various species, but include references in their bibliography that clearly state that this method of ageing is more often than not unreliable. In their conservation chapter Ernst and Lovich continue to support their beliefs that head-starting and other manipulative practices are unlikely to become sound conservation tools. While the conservation chapter's text at first reads as a rather neutral explanation of the topic, it fails to present information on any of the head-starting programs that have proven to be successful, and downplay the potential for such efforts. Then in the Kemp's ridley account they describe the success of the head-starting program for that species, but go on to nitpick its actual merits. Well, of course there are setbacks and screw-ups; these are pioneering programs where people are learning as they go. Despite this, many of these programs have by now been shown to be successful. And what of all the individual turtles that are actually helped, or the resulting increase in public education and awareness of the issues regarding their plight? Are experimental and sound management practices to remain forever trumped by the rigors of academics? Good conservation strategy requires not only that all options remain open, but that new approaches are tried and that we ask for more involvement from the public sector.

This volume replaces the former edition as the standard reference for all levels of interest, from professional herpetologists to amateur naturalists, and for libraries of universities, museums and nature centers this is now THE turtle reference for North America. The authors have captured, organized, and explained the biology of our continent's extremely diverse chelonian fauna. This book is not a summary or haphazard overview of what is known about each species, it is a species-by-species series of comprehensive accounts. It will be the first book you pick up when you need the answer as to what is currently known about any biological aspect of our native turtles. The former edition served as our standard "go to" reference for 15 years; I suspect this one should be good for at least a quarter of a century. How many ways can one say this is an important, must-have, monumental, definitive, reference? I give it five *Clemmys*, well, depending on the species, maybe 4½–4¾ *Glyptemys*!

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What You Missed at the September Meeting

John Archer
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Ephrin-A5 exerts positive or inhibitory effects on distinct subsets of EphA4-positive motor neurons

Long-distance cue from emerging dermis stimulates neural crest melanoblast migration

Identification of an invariant response: Contact with Schwann cells induces veil extension in growth cones

Above are titles of representative papers authored or coauthored by Dr. Kathryn Tosney. I know that many of you understand what each of those papers is about. I don't have a clue. Dr. Tosney is a developmental neurobiologist. She graduated from the University of Oregon, took her Ph.D. at Stanford University and did her post-doc work at Yale University and the University of Connecticut. She was a professor and associate chair of biology at the University of Michigan. She is currently chair of the Biology Department of the University of Miami. She's been the recipient of multiple awards both as a student and a teacher; written and collaborated on numerous papers; lectured on writing clearly, career survival in the world of academia, and creating effective posters. She's created crossword puzzles and origami to aid students in understanding biology. I had to pick her up at O'Hare and Mike Dloogatch and I would be her hosts for the next two days. I was nervous. What do I say to a developmental neurobiologist?

Her web page (<http://www.bio.miami.edu/ktosney/>) had a link that hinted at why she was addressing the CHS at our September meeting, along with a few intimations that she might not be as intimidating as her bio page first led me to believe. She's crazy about lizards, especially bearded dragons. Her web page has a whole section devoted to them (along with a cool photo of "a cultured sensory neuron extending a growth cone with long thin filopodia.") She was active in the Michigan Society of Herpetologists and has attended the National Reptile Breeders Expo in Daytona for the last ten years. She's applied her obviously fine intellect and superior research skills not only to her profession but also to her hobby. She was in town to talk to us about some of her findings. Her talk was titled "How Human Selective Breeding Has Changed Australian Bearded Dragons."

Dr. Tosney walked off the plane carrying a bag with the book *The Lizard King* exposed, thinking that it would allow me to recognize her as a herper. It worked, and from our first meeting it was hard for me to think of her as anything other than a fellow enthusiast and a friend. During the two days that Mike and I had the privilege of escorting her I enjoyed sharing her pleasure



Photograph by Dick Buchholz.

in the sights that we managed to squeeze in. Her excitement at photographing a baby shingleback skink (*Tiliqua rugosa*) at the Lincoln Park Zoo was contagious, and she readily put up with my many questions about everything from the workings of academia to the sea cucumbers (*Holothuroidea* spp.) at the Shedd Aquarium (she took marine biology courses in her undergraduate days).

Dr. Tosney had started out the day giving a lecture on career development to a group at the University of Chicago and, with Mike and me, spent an entire afternoon at the Shedd interrupted for only short periods that allowed her little chance to be off her feet. In

spite of that, Kathryn brought enthusiasm and animation to her presentation, so much so that when making her frequent gesticulatory emphases she often forgot that she had a mike in one hand, causing a drop in volume and necessitating a quick realignment of mike to mouth.

She started with what selective breeding accomplishes not only consciously but also unconsciously with the selection of traits both good and bad. Humans often selectively breed animals for particular colors, size, temperament, and intelligence, perhaps unconsciously selecting for juvenile appearance and reaping the side effects of a limited gene pool such as loss of genetic diversity, hidden health defects, developmental defects, and inbreeding depression. In the process we very well may be domesticating the bearded dragon (*Pogona vitticeps*). According to evolutionary biologist Jared Diamond, animals that can be domesticated need certain characteristics: a flexible diet, reasonably fast growth rate, modifiable social hierarchy, pleasant disposition, and the ability to breed in captivity. Dr. Tosney proposed that bearded dragons have all these characteristics. Indeed, they also have language in the form of gestures conveying certain meanings that can be recognized interspecies and even modified by the lizards to fit a new situation. With a funny demonstration she recounted her head-bobbing exchange with a male dragon in the San Diego Zoo. Kathryn had to use her hand, but with bobbing motions of that appendage she has managed to make males aggressively reply with their head bobbing. She cleverly described the courting behavior of dragons that include a leg wave by the female to indicate that she is not ready for mating. Kathryn once had a female dragon that adapted that motion to indicate when she'd had enough crickets and was finished eating.

The first bearded dragons in the U.S. came from Germany, where they had been bred for size and robustness. They often



The beardies first brought from Germany often reached 24" and had sharp noses.

reached 24" and had very pointed snouts. Shortly after they reached the U.S., most of our dragons were bred smaller with more rounded faces. It's been postulated that juvenile features may allow a bonding with adults, thus avoiding the babies winding up as food for their parents. As is apparent in many of our pets, juvenile traits have a trans-species appeal. Dr. Tosney described studies that demonstrated that symmetry is also a sought-after trait in the animal kingdom, including humans. Using pictures of men and women who had one picture unaltered and the other halved and then mirror-imaged, the study proved that people perceived the more symmetrical as more beautiful. This preference for symmetry has been demonstrated in several species, and Kathryn presented a black-and-white slide of several dragons' backs side by side. Seemingly a contradiction to her earlier point, the symmetry of the lizards' patterns increased from left to right but the price that each dragon commanded increased from right to left. To show why, her next slide was in color and showed increased color intensity from the native color of a bearded on the right to the spectacular flashes of red on the dragon on the left. More spectacular morphs are worth more.



Baby dragons are cute. We in the U.S. have bred the adult dragons to be smaller and have more rounded faces so that they too look cute.

But what do the asymmetrical patterns of the more spectacular morphs indicate? Here Dr. Tosney put her career skills to use and explained that cells known as neural crest cells control not only the symmetry of the body, but also control the symmetry of the pattern on the animal, so the pattern may be a clue as to how inbred the animal is and thus how robust and healthy the animal is. As a developmental neurobiologist, Dr. Tosney knows that the genes that control the neural crest cells also control many other developmental processes. Therefore she proposes that symmetry may be an indicator of the animal's overall fitness, an explanation that would also help explain the tendency of so many species to favor more symmetrical individuals when selecting mates.

Those of us who breed animals should be concerned with these issues when selecting breeders for desired traits; we need to beware of the unconscious results of inbreeding such as loss of genetic diversity, greater mortality, decreased robustness, and a greater sensitivity to environmental factors during development that could cause birth defects. Simply by paying attention to the symmetry of the pattern on the dragons' backs, breeders and purchasers may be able to steer clear of many of those pitfalls. With a cute slide of one dragon appearing to hold shut another dragon's mouth, Dr. Tosney ended her talk. It was a great pleasure to listen to her and a greater pleasure to hang out with her. Sometimes I love this job.

On October 9 and 10 the CHS hosted the 25th annual Midwest Herpetological Symposium. Those of you who didn't make it missed a great symposium. Our colleagues from the other Midwest societies had nothing but praise for the speakers, the venue, the entertainment, the hospitality suite, and the auction. Even the souvenir gifts were justifiably lauded. A lot of people in your society put a lot of time and hard work into making this an event truly representative of the quality of the Chicago Herpetological Society, but special thanks go to the efforts of Jason Hood, your vice-president, who coordinated the efforts and spent many hours making the affair one that everyone appreciated. Next year's MHS will be hosted by the St. Louis Herpetological Society, and while we've set the bar high, they seem determined to ensure that you'll want to attend. You missed this one; you going to miss another?

At our last board meeting we decided to allow some limited dry-goods and feeder sales by vendors at the monthly meetings. We're working out the rules, but as it stands now, vendors must be members and registered, and sales will be limited to dry-goods, frozen feeders, and live feeder insects. No live animals! If you're interested, please contact me. Remember that I'm periodically (a more polite way of writing, "When I feel like it.") sending out emails about the activities of your society and some herp-related links that may interest you. They're free (like I could charge) and anyone can receive them. If you send me an email, I'll put you on the mailing list. If you send me a friend's email, I'll put them on the list. If you send me the President's email, I'll know you're joking. If you're receiving duplicates or don't wish to receive them (we all really do get too much email), let me know and I'll correct the situation. Come to a meeting! Introduce yourself! Let us get to know you!

Herpetology 2009

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

HAWKSBILL NESTING IN GUADELOUPE

S. J. Kamel and E. Delcroix [2009, J. Herpetology 43(3): 367-376] note that hawksbills (*Eretmochelys imbricata*) have been the focus of conservation efforts over several decades and their status in the Caribbean is continuously being evaluated. Surprisingly, it appears that the island of Guadeloupe hosts one of the largest hawksbill populations in this region, highlighting the importance of making the most recent data available for the purposes of wildlife management. Numbers of nesting females and other biometric data collected over eight nesting seasons are presented as well as a number of biological observations unique to this population. A total of 452 females were tagged, 89 of which were thought to have been previously tagged, and 58 remigrants (turtles tagged in previous seasons) were observed. Four of the remigrants were seen in three different nesting seasons, and one was seen in four. Mean minimum curved carapace length was 87.9 cm, and mean clutch size varied significantly between two study years (2002: 137 ± 26 eggs; 2004: 159 ± 29 eggs). One turtle laid a clutch of 276 eggs, the largest ever recorded for a hawksbill. The initial estimate of the nesting population in Guadeloupe is encouraging and perhaps is a sign of increasing numbers in the wider Caribbean region. This information is important when considering the status of this endangered species, and these data need to be easily accessible to the conservation community.

PREY ODOR SELECTION BY NIGHTSNAKES

R. E. Weaver and K. V. Kardong [2009, Copeia 2009(3): 475-482] studied the effects of various shelter and prey odor combinations on selection of microhabitat characters by the desert nightsnake, *Hypsiglena chlorophaea*, a dipsadine snake. They also examined the activity patterns of these snakes over a 23-h period. Three prey odors were tested, based on field work documenting natural prey in its diet: lizard, snake, mouse (plus water as control). In the first experiment, each odor was tested separately in various shelter and odor combinations. Snakes were found to prefer shelter to no shelter quadrants, and most often selected a quadrant if it also had prey odor in the form of lizard or snake scent. However, snakes avoided all quadrants containing mouse (adult) odor. In the second experiment, all three odors plus water were presented simultaneously. The snakes showed a preference for lizard odor over the others, but again showed an aversion to mouse odor, even compared to water. The circadian rhythms in both experiments showed generally the same pattern, namely an initial peak in activity, falling off as they entered shelters, but then again increasing even more prominently from lights off until about midnight. Thereafter, activity tapered off so that several hours before lights on in the morning, snakes had generally taken up residence in a shelter. Prey preference correlates with field studies of dietary frequency of lizards, while activity exhibits strong endogenous nocturnal movement patterns.

TERRESTRIAL HABITAT USE BY RED-BELLIED WATERSNAKES

J. D. Camper [2009, Copeia 2009(3):556-562] notes that terrestrial habitats around wetlands are important in wetland conservation because many vertebrate animals use them during part of their life cycle. There is relatively little information concerning terrestrial habitat use by aquatic snakes adjacent to wetlands. Radiotelemetry was used to study the spatial ecology and terrestrial habitat use of *Nerodia e. erythrogaster* in the upper coastal plain of northern South Carolina. Snakes used terrestrial habitats extensively during the summer and fall. Use of both wetlands and southern mixed hardwood forest were significantly greater than predicted by habitat availability within the snakes' home ranges. Agricultural fields were used significantly less than predicted. A distance of 344 m from wetlands is necessary to encompass 95% of the terrestrial localities documented in this study. Home range estimates based on 95% fixed kernels were significantly larger than those calculated using the 95% minimum convex polygon methods. Home range estimates for this species are comparable to those of large terrestrial colubrids and are greater than home range estimates reported for congeners. Snakes spent an average of about ten days out of wetlands during terrestrial movements with a maximum of 23 consecutive days spent out of a wetland. These results suggest that in excess of 300 m of forest habitat buffering wetlands may be necessary to sustain populations of *N. erythrogaster*.

BURROW USE BY GOPHER FROG METAMORPHS

E. A. Roznika and S. A. Johnson [2009, J. Herpetology 43(3): 431-437] note that the transition from aquatic to terrestrial habitat is thought to be a period of high mortality for amphibians. We used radio telemetry to estimate survival and study factors influencing survivorship of newly metamorphosed gopher frogs (*Rana capito*). Predation was very high and only 12.5% of frogs survived their first month in the terrestrial habitat. All documented predation occurred during the frogs' initial 12 days in the uplands, and snakes (*Coluber constrictor* and *Thamnophis sirtalis*) were the major predators. Also, frogs were preyed upon by mammals and birds and killed by vehicles along dirt roads. Survival rates varied among ponds, with the survival rate at one pond being significantly lower than survival rates at three other ponds. Survival of frogs was dependent on their use of underground refuges, particularly burrows excavated by gopher tortoises (*Gopherus polyphemus*) and small mammals. Using underground refuges reduced the risk of mortality to only 4% of that faced by frogs while in the open environment; in fact, all surviving frogs located a burrow within their initial eight days in the terrestrial habitat and remained there for the duration of tracking. Our results demonstrate the dependence of gopher frogs on underground refuges and suggest that the availability of burrows near breeding ponds influences survival of juveniles and, thus, the recruitment of adults.

Unofficial Minutes of the CHS Board Meeting, September 18, 2009

The meeting was called to order at 7:40 P.M. at the Schaumburg Public Library. Board members Aaron LaForge, Brad Trost and Jenny Vollman were absent.

Officers' Reports

Recording Secretary: Cindy Rampacek read the minutes of the August 14 board meeting and minor corrections were made.

Treasurer: Andy Malawy presented the financials and they were accepted with no questions.

Membership Secretary: Mike Dloogatch informed the board that membership stayed stable and then proceeded to share the expiring memberships. We need to request that Aaron adds an option for multiple-year renewals on the website.

Corresponding Secretary: Deb Krohn needed a few mailing addresses, which Mike Dloogatch supplied.

Sergeant-at-arms: In Dan Bavirsha's absence it was reported that there were 48 people at the August meeting.

Committee Reports

Shows:

- SEWERFest, November 1
- Snake Day, Milwaukee Public Museum, November 7.
- Emily Oaks Nature Center, November 15.

Old Business

Symposium 2009: Static displays—Herps of Illinois stuff and IRCF have confirmed. We still need to contact Mike Corn, WDC, Chicago Wilderness, USARK. Eric Thiss is thinking of offering attendees discounts on his books on Sunday and possibly a static display. Rather than shot glasses, we are currently looking at snake bags. We are waiting for a quote from Midwest Tongs. Name badges are designed and are very cool looking. Speakers are set. T-shirts are ordered.

Construction of a bike trail through massasauga habitat has been delayed for the time being. Army Corps of Engineers have now hired lawyers. More to come.

New Business

We need a person to help catalog, store and transport books for the CHS library.

Jim Foster is the chair of the nominating committee. The other members are Karen Bielski, Dick Buchholz, Rick Hoppenrath and Steve Sullivan.

Round Table

Cindy played with a Komodo dragon in Florida and she is in love. Cindy has photos available.

Bob Bavirsha wants to give Cindy his croc monitor to cure Cindy's delusions.

Deb Krohn would like to discuss Kate Jackson's book at the

restaurant after the meeting.

Linda mentioned that Steve Sullivan was featured recently in the Nature Conservancy magazine.

The meeting adjourned at 9:04 P.M.

Respectfully submitted by recording secretary Cindy Rampacek

Answers to Herp-Acrostic #20

The quotation was taken from page 268 of *In Search of the Golden Frog* by [Marty] Crump:

"When I first studied poison dart frogs, very few nonbiologists had ever heard of them. These and other tropical frogs are now household images. Who hasn't seen poison dart frogs or red-eyed treefrogs on T-shirts, note cards, calendars, puzzles and even boxer shorts and ties?"

- | | |
|---------------------|---------------------------|
| A. Coachwhip | O. FitzSimons |
| B. Rivers | P. Toothy |
| C. Underwood | Q. Honduran |
| D. Mattison | R. Eyelash |
| E. Pittendrigh | S. Ghost |
| F. Idaho | T. Osage |
| G. Nests | U. Legless |
| H. Short-horned | V. Desert grassland |
| I. Exo Terra | W. Earlessness |
| J. Arizona | X. Northern dwarf |
| K. Red-spotted newt | Y. Fens |
| L. Coffee | Z. Rubber |
| M. Hoop | Z ₁ . Overdose |
| N. Offside | Z ₂ . Gravid |



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For sale: Rats—live or frozen. I breed rats for my collection of boas so only top quality lab chow and care will do, I'm now offering surplus animals for sale. Located in far south suburbs of Chicago. Only orders of 20 or more please, no large rats will be available. For current availability and prices, please e-mail Steve at smuys@sbcglobal.net.

For sale: Australia publications. *A Natural History of Australia* by Tim Berra; 1998, 304 pp., over 200 excellent color photos, 200 line drawings, tables, 38 pp. on herps, Berra is professor emeritus of zoology at Ohio State, this book is the result of 5 years driving over 100,000 miles in Australia, covers vertebrates, invertebrates, plants, culture, geography, DJ, (h), \$75. Each 128-pp. issue of the *Australian Geographic* contains well-researched articles illustrated with excellent color photos and ads, news, and other items of interest to Australophiles. April-June 1997 issue with 12-page, 15 color photo article on red-bellied black snake by Rick Shine. October-December 1997 issue contains 18 pp, 23 color photo article, "Fabulous Frogs." July-September 2000—18 pp., 29 color photos (some full page) and a fold-out of gecko illustrations, article entitled "Geckos—The Eyes Have It" by Steve Wilson of the Queensland Museum. Issues do not contain maps/posters, \$19 per issue. *Reptiles of South Australia* by T. F. Houston; 1973, 11 pp., 24 color photos, South Australia has about 160 species of reptiles, (s), \$12; Australian Wildlife Series—*Australian Snakes and Lizards*, 1981, 51 pp., many good color photos; covers all 5 of Australia's lizard families plus snakes, including the taipan and death adder, (h), \$22. s = softbound; h = hardbound. Prices are in \$US. All books in very good to excellent condition unless otherwise indicated. Books offered subject to prior sale. Orders for \$25 or more sent postpaid in the U.S.; \$3.00 postage and handling in the U.S. for orders under \$25. William R. Turner, 7395 S. Downing Circle W., Centennial, CO 80122; telephone (303) 795-5128; e-mail: toursbyturner@aol.com.

For sale: Trophy quality jungle carpet, diamond-jungle, and jaguar carpet pythons. Website: moreliapython.googlepages.com E-mail: junglejohn@tds.net

For sale: Will soon have Malagasy cat-eyed snakes, *Madagascarophis*, four clutches, total of 24 eggs, all looking good. These are from several females of different colors. We were not able to get locality data on the adults. All are long-term and several young are over a year old. Asking \$200 each or \$250/pair. If interested, call Dave at (903) 769-9314. I will return any and all calls as soon as possible.

Herp tours: Adventure trips to **Madagascar!** Journey somewhere truly unique to seek and photograph nature on the world's least-studied mini-continent. For maximum herp fun and discovery, join Bill Love as we go where few people will ever venture in their lives. Let his experience assure a comfortable tour finding the most colorful and bizarre species on the planet! Get all the details at Blue Chameleon Ventures' comprehensive new website: <<http://www.bluechameleon.org>>, E-mail: bill@bluechameleon.org, or call (239) 728-2390.

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Line ads in this publication are run free for CHS members—\$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: MADadder0@aol.com

News and Announcements

2010 CHS HERPETOLOGICAL GRANTS PROGRAM

The mission of the Chicago Herpetological Society is education, conservation and the advancement of herpetology. To further this mission, the CHS provides grants of up to \$1,000 in the following categories:

1. Illinois Herpetology
2. Graduate Student Research in Herpetology
3. Undergraduate Research in Herpetology
4. Conservation
5. Captive Management, Husbandry and Propagation

The number of grants awarded in each category will depend on the grant applications received; it is possible that not all categories will receive awards and some categories may receive more than one award. The Grants Committee reserves the right to reassign the category under which a given proposal is submitted.

To qualify for a grant, the applicant must be a member of the Chicago Herpetological Society as of December 31, 2009. In accepting a grant, the recipient agrees to acknowledge the Chicago Herpetological Society in any publications or public presentations of research funded by this grant. Further, the recipient agrees to abide by all state and federal laws.

Recipients must submit a short report of their research findings to the CHS within 6 months of their anticipated completion date. The report should be written for a general audience and be suitable for publication in the CHS *Bulletin* or on the CHS webpage. This requirement may be waived if results will be published in a peer-reviewed journal within a year. Recipients may be invited to present a program at a CHS general meeting.

Applications must include the following:

1. Project title
2. Applicant's name, address, phone and email
3. Submission category
4. Introduction—Provide background for the proposed work. Include a clear statement of the objectives of the proposed work.
5. Materials and methods—Describe the study site and the materials and methods (in non-technical terms) that will be used to accomplish the objectives of the proposed research. Attach plans, diagrams and maps as necessary. Indicate whether you have an approved Animal Care (IACUC) protocol covering the proposed methods or whether you will be submitting such a protocol.
6. Applicability and broader implications—How does this work apply to conservation, education and the advancement of herpetology?
7. Budget—Indicate the budget for the entire project and make clear what portion the CHS grant money would fund.
8. Anticipated completion date for the research
9. Applicant curriculum vitae
10. Letters of support—Student applicants must include a letter of support from a faculty advisor. For non-academic individual and institutional applicants, letters of support from collaborating partners or institutions are strongly encouraged. Letter(s) of support may be emailed and should include an address and phone number at which the writer can be contacted. Letter(s) of support may also be sent by postal mail.

Proposals should be submitted as email attachments. Attachments should include the applicant's name in the file name. Proposal text should not exceed five double-spaced pages (excluding literature cited, applicant's CV, and letters of support) and should be typed using a common font (e.g., Arial, Times, Courier) no smaller than 10pt. Applications must be received by December 31, 2009, and awards will be announced by February 15, 2010.

Proposals should be emailed to grants@chicagoherp.org

Questions should be directed to Mike Dloogatch (773) 588-0728, or grants@chicagoherp.org

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, October 28, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Matt Goode**, a research scientist at the University of Arizona in Tucson, will speak on “Ecology and Conservation of the King Cobra (*Ophiophagus hannah*) in the Western Ghats of India.” Matt and his co-workers used radiotelemetry to conduct the first-ever study of wild king cobras in the Western Ghats of India, near Agumbe Rainforest Research Station, in the district of Shimoga, state of Karnataka. Matt will discuss the results in the context of ongoing conservation concerns, emphasizing potential effects of habitat fragmentation, and translocation of snakes “rescued” from human habitations.

The November 25 meeting will include the annual election of officers and members-at-large of the CHS Board of Directors. And we’ll have an interesting program as well. **Carl Koch**, a CHS member from Milwaukee, will be speaking about his amazing experiences with hog-nosed snakes in Wisconsin. In the last couple of years he has documented many natural history events. His observations on their nest building were featured in the February 2009 CHS *Bulletin*.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

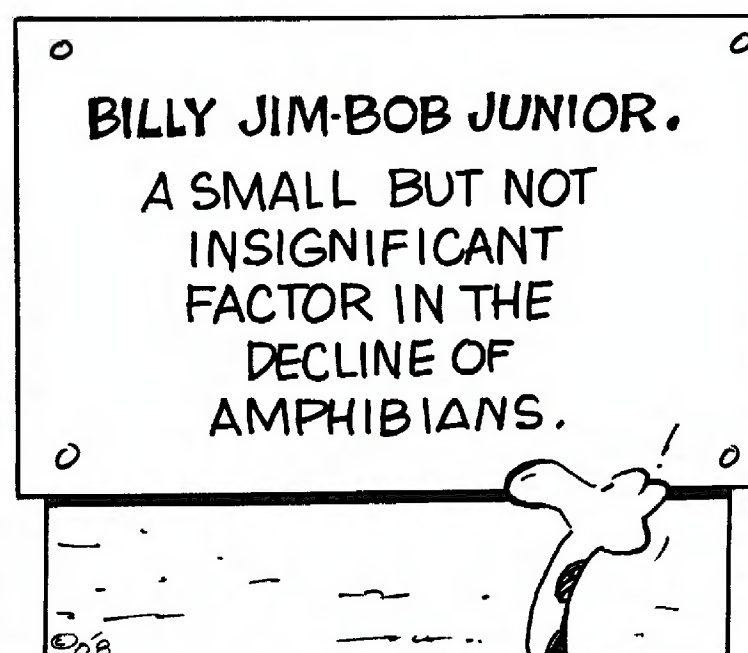
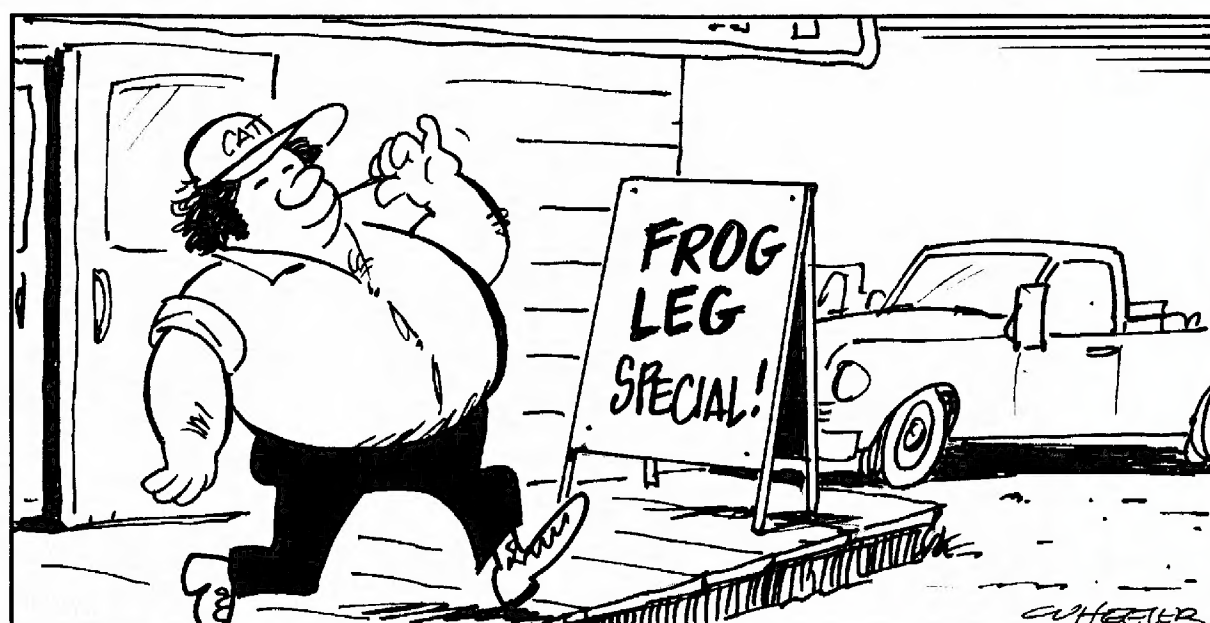
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., November 13, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the CTC website: <http://www.geocities.com/~chicagoturtle>.

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